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THE AGRICULTVRAL STVDENT

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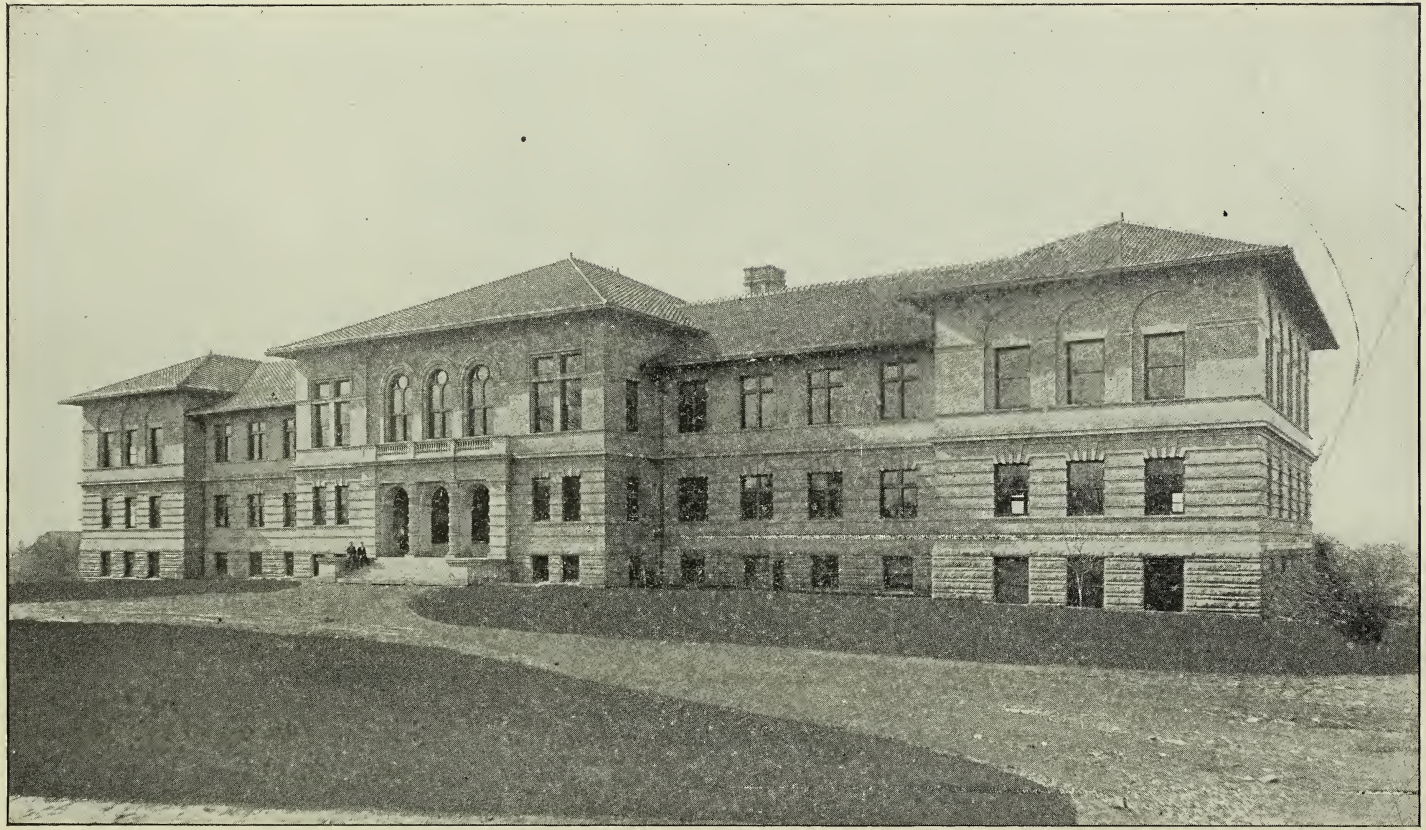

TOWNSHEND HALL.

THE AGRICULTURAL STUDENT.

VOL. V. OHIO STATE UNIVERSITY, COLUMBUS, SEPTEMBER, 1898. No. 1.

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EDITORIAL CHAT.

With this issue, the management of the Agricultural Student takes up another year's work. We will dispense with the usual account of how we started and how we have progressed and proceed to a short definition of our plans for the coming school year.

As has been stated before, the Student is not intended to take the place of a college newspaper, and we leave matters of a newsy nature to the Lantern. However, matters of general importance to the University, and particularly such as concern the College of Agriculture will be dealt with. But the endeavor of the editor of this magazine will be to publish the result of such scientific investigation and original research as may be carried on at the University in all lines, but especially in agriculture and its allied branches, and the natural sciences.

And here we wish to request that all ex-students and alumni consider it their privilege and duty to report things that may be of scientific interest that we may use them in our columns, and that we all may profit by knowing them. It is especially requested that all experimental work be reported to us that we may publish it along with the results of the experiments that are being carried on by the members of the Agricultural Students' Union of Ohio.

We wish to thank our many friends for their kind co-operation and help in the past, and hope that we will merit a continuance of the same good fellowship.

Just a word with alumni and ex-students. This paper is published by the students of the College of Agriculture and Domestic Science, and upon them devolves the entire responsibility for all financial affairs that concern it. It may not be generally known, but it is true, that the management of a magazine of this size and character is no small matter, and we wish to ask you to help us by sending in your subscription at once. The price is fifty cents a year, a small matter for you, but quite an item for us when all have paid up whose duty it is to do so. Now, we beg of you not to let this matter go unnoticed. "Short in money" is an old cry, but by reducing our subscription price one half, as we have done, we have made it possible for all to subscribe without a chance to object on account of the price.

It is not a great while since it was supposed that a genuine college education could not be obtained outside of a small circle of what are known as the eastern colleges. But at the present time it appears that colleges and universities west of the Alleghenies are coming up to the standard set by the older schools of the east and in some ways are rising above this standard. This is notably true in some branches of agricultural education. In soil physics, for instance,

the greatest work is being done in the west, and the pioneer in physical investigation of the soil is a western college man. In stock feeding and breeding, the western colleges present men who cannot be surpassed anywhere. While in horticultural subjects, the greatest authorities are generally in the older parts of the country and in the vicinity of large cities, authorities upon different branches of the subject are pretty well scattered over the entire country.

In general organization the western agricultural colleges, as a class, are undoubtedly in the lead, although certain eastern colleges have better resources and a wider reputation. In view of the change in recent years, however, we see the line between the eastern and western institutions of learning less sharply drawn than formerly, and as the power born of experience becomes stronger, the line will gradually become obliterated.

Personal Notes.

Several members of the University faculty attended the annual meeting of the American Association for the Advancement of Science, at Boston, during the last week of August. Professor Weber and Professor Lazenby also attended the meeting of the Society for the Promotion of Agricultural Science which was held on the 19th and 20th. Professor Lazenby read two papers at this meeting. One on the "Dichogamy of Indian Corn" and one on "Judging or Scoring Fruits." Professor Weber read a paper on "Light, a Factor in Sugar Production" before the American Chemical Society.

Mr. W. C. Mills, who graduated in Horticulture and Forestry with the class of '98, was appointed curator of the Ohio Archaeological and Historical Society soon after his graduation. Mr. Mills has been interested in this work for many years and his private collections are unusually fine. With his experience in collecting and his natural aptness to succeed, we feel that he will be an immense help to the society and to the University in bringing together fine museum collections of historical and archaeological interest.

The many friends of Homer C. Price, of the class of '97, will be glad to learn of his appointment to the Fellowship in Agriculture in Cornell University. Mr. Price is a fine student in several lines of work and we commend the choice of the College of Agriculture at Cornell in selecting him as a Fellow.

The chair of Zoology and Entomology, vacated by the death of Professor D. S. Kellicott, will be filled by Professor Herbert Osburn, late professor of zoology and entomology in Iowa State College. Professor Osburn enters upon his duties with the opening of the fall term on September 14.

Of the class of '98, from the College of Agriculture, we have the following at hand: G. A. Flickenger is successfully operating a large creamery at Padua, O.; W. C. Mills is curator of the Museum of Archaeology at this University; A. W. Nettleton, of Medina, O.; C. W. Waid, of Emery, O., and Carl J. Miller, of Franklin, O., are all engaged in practical agriculture or horticulture at their respective homes. C. K. McClelland, who enlisted in the United States army upon the first call for volunteers, is now in Porto Rico with the Fourth O. V. I.

J. C. Britton has been engaged in expert work for the McCormick Harvester Company.

Mr. George W. Campbell, of Delaware, O., the celebrated grape specialist, passed away July 15, having completed his 82nd year. American horticulture owes much to the intelligent, persistent and well directed labors of Mr. Campbell in the dissemination and improvement of the grape. One variety, the Campbell's early, but recently introduced, bids fair to keep his memory green and his name from the fate of the flower that fadeth and the grass that withereth. The Columbus Horticultural Society, of which Mr. Campbell was an honorary

member and true friend, contributed a beautiful floral offering and several members attended the funeral.

Another who has been prominent in agricultural circles has also been recently called to cross the dark river. Dr. E. L. Sturtevant, the first director of the New York Experiment Station and one of the founders of the Society for the Promotion of Agricultural Science, a well known writer and worker in scientific agriculture, died early in August at his home in South Fremington, Mass.

Professor W. B. Alwood, of Blacksburg, Va., a former student of the Ohio State University and first agriculturist of the Experiment Station, is a candidate for one of the United States Commissioners of the Paris Exposition in 1900. Mr. Alwood is well qualified for the position and is receiving such strong indorsement that the appointment will probably be made.

Horticultural Hall has been thoroughly renovated the past summer and many improvements have been made. A large and neatly furnished class room, enlarged laboratory facilities, and a better library and reading room are among the signs of progress in the Department of Horticulture and Forestry.

Society for the Promotion of Agricultural Science.

This society met in Boston, Mass., on August 19 and 20, 1898. The sessions were held in Horticultural Hall and began at 2 p. m. on Friday, the 19th. The executive session, for the election of officers and the transaction of miscellaneous business was held on Friday night.

The following papers were read at this meeting, but not necessarily in the order named:

Presidential Address, "The Society's Progress," B. D. Halsted.

"Some Physical and Chemical Peculiarities of Arid Soils," E. W. Hilgard.

"Bacterial Disease of the Sugar Beet" (By invitation), Clara Cunningham.

"Quarantine Against Foreign Insects. How Far Can It Be Effective?" J. B. Smith.

"The Effect of Electric Light Upon the Tissues of Leaves," W. W. Rowlee.

"The Composition and Comparative Value of Lawn Grass Mixtures as Purchased in the Markets," W. J. Beal.

"Movements of the Food and Ash Elements in the Maturing Corn Plant" (By invitation), C. D. Smith.

"Shot Hole Effect of Peaches and Plums," B. W. Duggar.

"Notes on Self-fertility of Cultivated Grapes," S. A. Beach.

"Plant Individualism" (By invitation), J. F. Kinney.

"Biographical Sketch of E. Lewis Sturtevant," C. S. Plumb.

"Problems Connected With the Attacks of Jassidae on Grasses," H. Osborn.

"Some Notes on Progress in the Study of Varieties of Timothy," A. D. Hopkins.

"The Influence of Fungi in the West," C. E. Bessy.

"Concentrated Cattle Foods and Laws for Their Control" (By invitation), J. B. Lindsey.

"A Few Points Demonstrated for Our Locality in Growing Forest Trees for Twenty-two Years." W. J. Beal.

"Judging or Scoring Fruits," W. R. Lazenby.

"The Effect of Nitrogenous Fertilizers Upon the Percentage of Protein in Grasses and Legumes" (By invitation), C. S. Phelps.

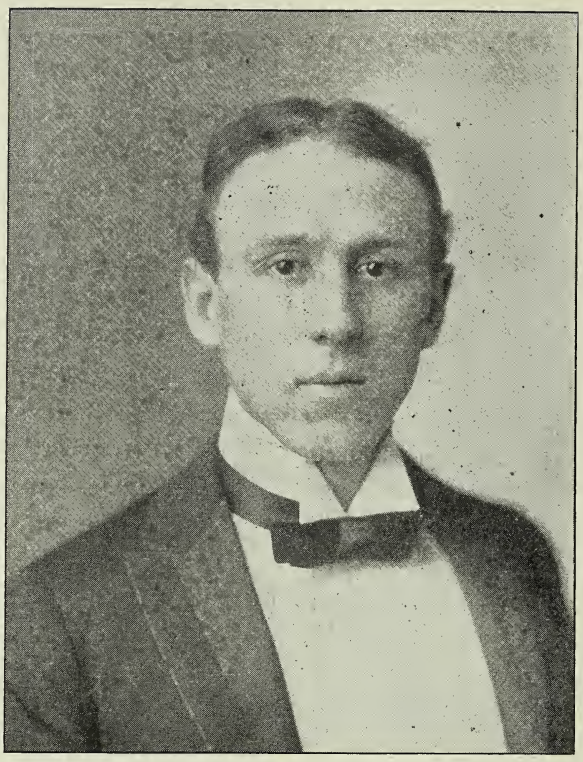
"Some Results on the Germination of Cereals," L. H. Pammel.

"The Dichogomy of Indian Corn," W. R. Lazenby.

"Insects Detrimental and Destructive to Timber and Timber Products," A. D. Hopkins.

"The Winter Food of the Chickadee," Clarence W. Weed.

"The Cereals and Their Relation to the Life Zones in North America," C. S. Plumb.



Charles William Burkett, M. Sc.

Mr. Burkett is, without doubt, one of the foremost men among the graduates from the College of Agriculture of the Ohio State University; while still an under-graduate he was the instigator of reforms that will stand as a lasting good to the college, and as an alumnus he has ever been alert to the interests and welfare of the college of which he is a graduate.

Charles W. Burkett was born at Thornville, Perry county, Ohio, January 3, 1873. His boyhood was spent upon the farm, while he attended district school and completed a course in the Thornville High school. In 1891, he graduated from High school with first honors, and in the fall of the same year he entered the Ohio State University. Until that time, he had intended to enter the legal profession, but upon entering the University he became interested in scientific agriculture and agricultural education. He completed the long course in agriculture, and graduated in 1895.

Before graduating, Mr. Burkett was a general college man, and took a deep interest in all college affairs. He was especially strong in literary work, was one of the founders of Townshend Literary Society and was its first president. He took part in the exercises at three of the anniversaries of this society. He was also an active member of Horton Literary Society and held various offices, including that of president. He was anniversary orator for that society in his sophmore year.

In his junior year, he was arbor day orator for his class, and in his senior year was elected a member of the first Student Senate.

He was pipe of peace orator for his class at graduation, and was a member of the Board of Editors of the Lantern during his junior and senior years.

During the summer of 1894, he conceived the idea of a publication of a pa-

per by the students of the College of Agriculture, and the Agricultural Student is the result of his work in that direction. He was the first editor and has been connected with the paper ever since its founding, either as editor or business manager.

For two years he was editor of the Agricultural Department of the Ohio State Journal.

At the time of his graduation, from a choice of three positions, he accepted that of Assistant in Agriculture in his Alma Mater, and held the same position until June 1, 1898, when he was appointed Assistant Professor of Agriculture in New Hampshire College.

Mr. Burkett took his Master's Degree in 1898. The subject of his thesis for this higher degree was "A History of Ohio Agriculture" and embodied the results of extended research into the subject.

At present he is Secretary-Treasurer of the Agricultural Students' Union of Ohio, of which he was one of the organizers. During the past two years he has been one of the State Farmers' Institute lecturers, and his work in this department has been highly satisfactory to all concerned.

While he is an aggressive and hard worker in whatever he undertakes, Mr. Burkett possesses in a marked degree the finer qualities and attributes that make a character worthy of praise, and in his inmost nature, he is what he always appears to be, and what can be defined only by that strong and all-embracing term—a man.

Sanitary Milk.

With the advent of its new building, the Department of Agriculture has made some change in the conduct of its retail milk trade, which it has long had in view. The work connected with the dairy herd, consisting of thirty to forty cows, and the handling and sale of the milk, is entirely done by students. During the school year ten students are employed in this work. Two have charge of the feeding and handling of the cattle and one of these, known as the division chief, has general charge of all the work. Two are required to sell the milk, two to cooling, separating and bottling the milk, and four to do the milking. By this means the milkers go to their work without having done any other work which might contaminate the milk. Care is also taken to feed the cattle and clean the stables at such times that the air of the stables will be as pure as possible at milking time. The fore milk, which contains large numbers of putrefactive bacteria, is rejected. The milk is then passed through a centrifugal separator. The centrifugal force cleanses the milk of the bacteria and other undesirable substances. In the process of separation enough skim milk is removed to bring the butter fat up to five per cent., that is, to have five pounds of butter fat in one hundred pounds of milk. Four per cent. is the average of a large number of analyses of milk made by the experiment stations throughout the United States. After the milk has been passed through a separator, it is then cooled and placed in sterilized bottles. The cap on the bottle bears the monogram "O. S. U. guaranteed five per cent. milk."

Bottled milk is probably the most dangerous form in which milk can be distributed, unless the bottles are properly cleaned and afterwards thoroughly sterilized. It is, on the other hand, the best method of distributing milk when properly done. The facilities for sterilizing, not only the bottles, but all tinware and apparatus connected with the handling of the milk, is unexcelled.

The Courses in Domestic Science.

Two years ago the Ohio State University recognized the demand for a broader education for young women, by introducing the Course in Domestic Science.

The course was planned, not particularly for city nor for country girls, but in the hope that it might appeal to the most womanly side of all women.

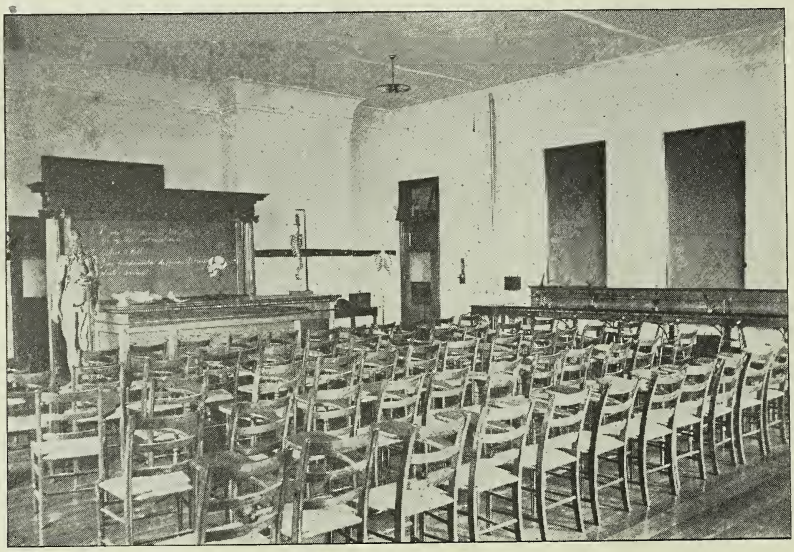
The desire was, and is, that by the practical and scientific study of home problems women may see more in household duties than a mere routine; and that by understanding the principles underlying economics, and by applying these laws in her particular realm, the wife may help to build not only a more ideal home, but a more ideal nation.

The course as here outlined, aims to give, first, a broad foundation in the sciences, languages and arts and then to apply this knowledge to living, in the broadest sense of the term.

add greatly to the possibilities for general pleasure and improvement.

The art of the past should appeal to us, not only because of its beauty, but because it is a nucleus about which we may build a more symmetrical future. Personal appearance, comfort and health are not of small consequence, but merit consideration on the part of everyone, and when science and art are equally balanced, the home will mean infinitely more than it does at present.

As outlined below, the lectures and laboratory work, dealing particularly



PHYSIOLOGICAL LECTURE ROOMS. BIOLOGICAL HALL.

The study of Chemistry, Botany, Zoology and Physiology makes it possible to understand the functions of various organisms, and to appreciate the changes constantly taking place in plants and animals. The analysis of foods and experiments with their effects upon the system, develop laws of wise living and so insure better physiques, intellects and morals. Economics certainly need to be understood and practiced nowhere more than in the home. History, Language, Literature, Pedagogy and Art all aid in broadening our knowledge of life and the people about us, and must with Domestic Science, require about one-fourth of the schedule time during the last three years of the course: the first year, and the remaining thirteen or fourteen hours required during each term of the second, third and fourth years being devoted to other university work.

How shall you write? First, have something to say, then say it as simply as possible. Whatever is written should be from experience and be told in a clear and concise manner

CIRCULAR OF INFORMATION.

Agriculture and Domestic Science in the Ohio State University.

Those who wish to learn the facts concerning the work of the College of Agriculture and Domestic Science, should send to Dean Thomas F. Hunt, Ohio State University, Columbus, for an illustrated circular of information. The courses in Domestic Science are especially designed for young women.

The university has thirteen buildings devoted to instruction. The lands, buildings and equipment are estimated to be worth over $2,000,000. The buildings of special interest to the college are Townshend Hall, Horticultural Hall, Veterinary Hospital, Hayes Hall, Botanical Hall, Biological Hall, Orton Hall and Armory and Gymnasium. The headquarters for the College of Agricul-

TOWNSHEND HALL.

university has expended over a quarter of a million dollars during the past two years upon new buildings and improved facilities for instruction. All of these improvements contribute more or less directly to the work of the College of Agriculture and Domestic Science, which is one of the six colleges of the university.

The university now has over eighty instructors and thirty-eight departments of study, offers thirty distinct courses, all but one of which requires two or more years for its completion.

Six of these courses are offered by the College of Agriculture and Domestic Science and are described in the above-named circular. These courses combine practical and scientific training with liberal culture. While all courses are open to men and women on equal terms, the ture and Domestic Science is in Townshend Hall, which has just been completed and equipped at a cost of over $100,000.

Special attention is called to the free scholarships which are offered by each county of Ohio in Agriculture, Horticulture, Domestic Science or Veterinary Medicine.

The circular describes the equipment, courses of study, requirements for admission, expenses and means of self-support. It will be sent free upon application.

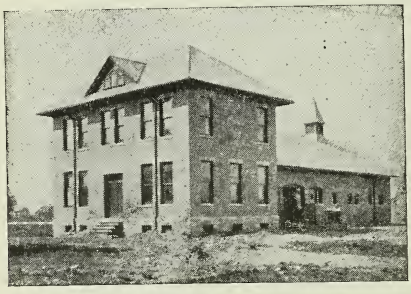
The College of Veterinary Medicine.

The College of Veterinary Medicine is one of the six colleges of the Ohio State University, and it provides a thorough education in all that relates to vet-

erinary medicine. The college consists of those departments represented in the course leading to the degree of Doctor of Veterinary Medicine and to a certificate of Veterinary Surgeon.

The college is under the direction of its own faculty, which has power to act in all classes pertaining to the work of the students of that college.

Veterinary students are taught during their college course by fourteen instructors, four of whom are regular, graduate veterinarians.



VETERINARY HOSPITAL.

COURSE OF INSTRUCTION.

The course of instruction covers a period of three years of nine-months' sessions, making it practically a four-year course. Most other veterinary colleges require but three terms of six months each to complete the prescribed curriculum. All reputable veterinary colleges have found it necessary to lengthen their courses, for a veterinarian, to be capable of successfully meeting all the questions that will confront him after he has left his alma mater and taken up the various duties of his professional career, must now-a-days be thoroughly trained and disciplined in the details peculiar to his calling.

The course which the Ohio State University offers, therefore, is intended to not only fit its graduates for the practical field, but also makes them capable of accepting any of the positions open to trained veterinarians. Among the alumni of the college are found a large per cent. holding official positions at good salaries. Men who have received their veterinary training at this college have, further, entered with success upon all lines of veterinary work.

There is a growing demand for men who are skilled veterinarians. The close relationship between veterinary medicine and general medicine—so-called "human" medicine, especially along sanitary lines, has opened to the veterinary profession a large, new field. At present a well-qualified veterinarian has his choice of the following fields of labor: 1—As an inspector and assistant inspector in the Bureau of Animal Industry. This is a very desirable berth, protected by the civil service,and the appointments are made for life. The lowest salary paid, to an assistant inspector, is $1200 per annum. The inspectors receive higher salaries, depending upon importance of their respective stations. Three of the last graduating class of the Veterinary College of the Ohio State University have already been appointed assistant inspectors, after having duly passed a rigid civil service examination. 2—As an instructor at an agricultural or veterinary college. These positions require the best trained men available, and pay good salaries. Six of our alumni are engaged in this work. 3—As an investigator of infectious and contagious diseases at state agricultural experiment stations. These positions are especially fitted to one who has the scientific ability and taste for original research. There is a great lack of men trained for such scientific work, our veterinary schools formerly teaching little or nothing of the sciences (botany, physics, bacteriology, pathological anatomy, etc.) which form the foundation of a veterinarian's scientific equipment. 4—As a veterinary surgeon in the cavalry service of the United States. A bill now pending before congress to elevate the standard of the army veterinary surgeons, granting them the rank, privileges and tenure of office of a commissioned officer, will make this service much more desirable than it is at present. However, the position now pays $900 to $1200 yearly, with perquisites. 5—As

a state veterinarian. Many of the states now have state veterinarians, and the time is not far distant when each state in the Union will have such an official to tend to the preventable diseases of the animals of his respective state. 6—As a veterinarian to municipal health boards, fire departments, etc. Already several of our larger cities employ veterinarians as inspectors of abattoirs, butcher shops: of milk and dairy products, and to assist in sanitary work generally. Besides, some cities require the services of a veterinarian to care for and administer to, in sickness, the fire and police horses of the municipality. As time progresses one may look for a greater demand for trained men from this source. Some of these positions pay as high as $2500 annually. 7—As a stock farm manager. A number of veterinarians are employed on stock farms in breeding districts as managers. A thoroughly prepared man should be able to find remunerative positions open to him in such a line of work. 8—Practice. For those wishing to enter upon a regular veterinary practice, desirable locations are still plentiful in many parts of the United States, in towns, cities and counties where there are no regular veterinarians. "With a ratio of three farm animals to every human being, and with less than one veterinarian to every ten doctors of medicine for man the balance of opportunity seems to be largely in favor of the veterinary practice, and this preponderance must steadily increase with the recovery of stock values and with the increase in numbers and individual value of farm animals."

A graduate of the Veterinary College of the O. S. U., if he has availed himself of his opportunities, should be capable enough to be successful in any of these branches of his chosen profession.

HORTICULTURAL HALL.

The Ohio State University does not depend for its maintenance upon student support, but is provided for by a state and national tax. Tuition is, therefore, free. Other expenses, such as laboratory fees, incidental fees and boarding, are moderate.

Illustrated bulletin sent free on application to Dr. White, Dean.

Additional Experiments with Potassium Sulphide and Formalin.

(By W. A. Kellerman.)

Since the liver-of-sulphur (Potassium Sulphide) was first used as a fungicide for the loose smut of oats and the stinking smut of wheat, by Mr. Swingle and myself in 1890, comparatively few experimenters have repeated our tests or in any way worked with this material.

Some of those who have experimented with the same have not commended it highly. In case of subsequent experiments, particularly with the smut of oats, I have obtained gratifying results.

This fungicide has not yielded results that compare favorably with the hot-water treatment. Nothing, in my opinion, even approaches the efficiency of this method. The value of hot water as a fungicide was conclusively established by the experiments which Mr. Swingle and myself carried on in the Kansas Experiment station, repeated later by Arthur, and then by hosts of experimenters all over the country. But many farmers who will not undertake the hot-water method yet may be willing to try a solution at ordinary temperatures; hence my continued attention to the potassium-sulphide treatment.

It should be mentioned here that Ceres pulver, the preparation made by Jensen (now sold in this country as well as in Europe), based on our original experiments, has proven in the hands of many, a comparatively satisfactory fungicide. It consists mostly of potassium sulphide of very good quality, and therefore what is said of the latter applies in the main to ceres pulver also.

The series of experiments here reported was undertaken mainly to determine the most favorable percentage solution of the liver-of-sulphur and the most desirable length of immersion. Some additional study was made also of formalin.

THE SEED.

The seed used was artificially smutted, that is, a large quantity of smut was added before sowing or before the treatments were made. This will doubtless account for some irregularities in the amount of smut, particularly in the untreated plots. The seed was sown in the latter part of October, 1897, in ground kindly placed at our disposal by the Agricultural Department of the Ohio State University. The stand was not good, owing to the very dry soil and extremely dry weather following. A fair crop was harvested, except from those plots where the seed was injured or entirely killed by the formalin treatment. A single bundle from each plot, taken from the middle, was counted, and the results are shown in the accompanying tabulation.

AMOUNT OF SMUT.

The average amount of smut in all the untreated plots was 37.28; with this, therefore, all the comparisons should be made. It will be noticed that the hot-water treatments practically prevented all the smut. The average of all these plots gave but 0.94 per cent. of smut.

SPRINKLING VS. IMMERSION.

Sprinkling the grain is the old method of applying copper sulphate or blue stone. This method is the one recommended by Jensen for ceres pulver. My experiments condemn it. No. 3, with ceres pulver, and No. 5, with potassium sulphide, show that the method is wholly inefficient for wheat infected with stinking smut. In case of smut of oats the sprinkling method might be fairly satisfactory. Wheat grains that are smutted are lighter than sound ones, hence they float and may be all skimmed off when the immersion method is used.

TIME OF IMMERSION.

An immersion of one minute, which is about the time necessarily consumed in putting in, wetting and immediately taking out the grain, is not satisfactory, as the summary here shows. A longer immersion is necessary. It should be over fifteen minutes. One hour is perhaps the minimum. On the other hand, a very long immersion, say several hours (the plan originally proposed by us), is objectionable for several reasons. The grain becomes so wet and swollen that it is difficult to dry it sufficiently for sowing. The germinating power finally becomes impaired. The grain is more disagreeable to handle the longer it remains in the solution. The time recommended is one hour, or but little more. The following summary is made from

TABULATION OF THE EXPERIMENTS.

Plot No	Fungicide.	Per cent. sol.	Immersion.	Heads counted.	Per cent. sm.
1	Untreated			999	40.40
2	Hot Water			983	1.12
3	Ceres Pulver		(Sprinkled)	697	37.16
4	Ceres Pulver		1 min	963	31.57
5	Potassium Sulphide	1	(Sprinkled)	945	45.17
6	Potassium Sulphide	1	1 min.	966	29.61
7	Potassium Sulphide	1	15 min.	958	20.67
8	Potassium Sulphide	1	60 min		
9	Potassium Sulphide	2	1 min.	915	11.37
10	Potassium Sulphide	2	15 min.	982	5.09
11	Potassium Sulphide	3	60 min.	945	9.63
12	Untreated			990	16.06
13	Hot Water			984	0.41
14	Potassium Sulphide	3	1 min	996	9.64
15	Potassium Sulphide	3	15 min.	993	7.86
16	Potassium Sulphide	3	60 min.	982	5.80
17	Potassium Sulphide	4	1 min.	982	5.80
18	Potassium Sulphide	4	15 min.	971	3.19
19	Potassium Sulphide	4	60 min.	994	3.42
20	Potassium Sulphide	5	1 min.	987	3.75
21	Potassium Sulphide	5	15 min.	972	1.75
22	Potassium Sulphide	5	60 min.	971	1.13
23	Untreated			993	46.63
24	Hot Water			976	1.64
25	Formalin	0.1	1 min.	579	15.37
26	Formalin	0.1	15 min.	923	2.28
27	Formalin	0.1	60 min.	922	1.41
28	Formalin	0.25	1 min.	943	0.32
29	Formalin	0.25	15 min.	850	0.24
30	Formalin	0.25	60 min	562	0 36
31	Formalin	0.5	1 min.	554	0.
32	Formalin	0.5	15 min.	225	0
33	Formalin	0.5	60 min.	170	0.
34	*Formalin	1.	1 min.	0*	
35	*Formalin	1.	15 min.	0*	
36	*Formalin	1.	60 min.	0*	
37	Untreated			993	40.58
38	Hot Water			959	1.05
39	†Formalin				
51	Ceres Pulver and Copper Sulphate	1	(Sprinkled)	769	32.64
52	Ceres Pulver and Copper Sulphate	1	1 min.	975	2.56
53	Ceres Pulver and Copper Sulphate	2	(Sprinkled)	983	5.39
54	Ceres Pulver and Copper Sulphate	2	1 min.	998	0.80
56	Hot Water			485	0.
57	Untreated Seed, Crop of 1895			768	3.52
58	Untreated Seed, Crop of 1895			478	3.77
59	Untreated Seed, Crop of 1895			874	21.28
60	Untreated Seed, Crop of 1894			798	8.90
61	Untreated Seed, Crop of 1893			686	1.60
62	Untreated Seed, Crop of 1893			495	0.20
63	Untreated Seed, Crop of 1892			350	0.

* Formalin, one per cent. solution, destroyed the germinating power of the seed almost completely.

† Solutions of Formalin two to five per cent. were used in plots 39 to 50, inclusive, but they completely destroyed the seed, and hence are not included in the tabulation.

the tabulation of the potassium sulphide treatments:

Time if Immersion.	Per. Ct. Smut.
One minute	11.97
Fifteen minutes	7.67
Sixty minutes	4.95

PERCENTAGE SOLUTION.

An inspection of the tabulation shows that a one per cent. solution is not efficient for the stinking smut of wheat. A two or three per cent. solution is fairly sufficient when the time of immersion is sufficiently prolonged. Even a stronger solution, either four or five per cent., may perhaps be more desirable. The suggestion is to use not less than a two per cent., nor more than a five per cent. solution.

FORMALIN.

This fungicide is one of the strongest yet known, even a one-tenth of one per cent. solution (or one part in one thousand) being efficient when the immersion is sufficiently prolonged. Plots were sown to seed that had been treated with solutions varying in percentage from one-tenth to five. But all of those from one to five per cent. seriously injured or wholly destroyed the seed. Even the one-half of one per cent. solution was somewhat injurious. In fact, the one-fourth per cent. solution (one part in four hundred) was thoroughly efficient in the practical sense. Perhaps a still weaker solution—as low as one-tenth per cent. —with an hour's immersion, would be advisable.

COPPER SULPHATE ADDITION.

Following the suggestion of Jensen, a few plots were sown to seed treated with a mixture of copper sulphate and ceres pulver, equal parts. The immersion was made but one minute for the purpose of comparing the result when sprinkled with the same percentage solution. As in case of the potassium sulphide treatments, the result here is decidedly in favor of the immersion method. As was to be expected, the fungicide is more efficient when copper sulphate is added. But the well known deleterious effects of the copper sulphate sufficiently condemn its use in large quantity or for prolonged time.

INFECTED SEEDS FROM TWO TO FIVE YEARS OLD.

Plots 57 to 63, inclusive, show the amount of smut when old seed is used, in each case known to be smutted. There are those who maintain that the smut will not grow after two years. Suffice to say that this assertion is not wholly correct. My experiments are too few and on too small a scale to warrant basing very full and definite conclusions thereon. But in case of plot 59, the seed being two years old when sown, there was a very large amount of smut, namely, over twenty per cent. This seed was furnished by Mr. E. C. Ellis, at my request, three years ago for use in this connection.

Notes on the Blossoming of Corn.

(By William R. Lazenby.)

There is no crop that so beautifies and adorns the farm as Indian corn. There is none in the United States that can compete with it in importance. From an economic and commercial point of view, it overshadows all other farm products. It is the foundation of animal industry and the sheet anchor of American agriculture. Nowhere else on earth is so much nutritious food produced with so little labor as in the spacious corn fields of the grand Mississippi valley.

This noble plant is distinguished from nearly all other cultivated species of the grass family by two important characteristics. First, it has a solid or pithy stem, and second, its flowers are imperfect. That is, the staminate flowers are situated at the top of the stem in the form of a branching head or panicle called the "tassel." The pistillate flowers are collected in a spike-like branch, which has its origin at a node or joint, and is situated in the axil of a leaf somewhere on the side of the stalk. The styles

and stigmas of these pistillate flowers are collectively called the "silk."

For some years the writer has been making observations upon the blossoming of corn and the following notes present some of the results of this study.

Among the varieties observed at different times may be mentioned the following, to which reference will be made:

DENT VARIETIES.

Leaming.
Chester County Mammoth.
Blount's Prolific.
Riley's Favorite.
Scott's Dent.

FLINT VARIETIES.

Compton's Early.
King Philip.
Waushakum.
Clarage.

SWEET CORN.

Cory.
Ford's Early.
Early Minnesota.
Stowell's Evergreen.

During the present year observations have been confined to the following varieties:

Burrill and Whitman.
Livingston's Dent.
Cleveland Eearly (sweet).
Four varieties from Buck, of N. J.

It is claimed for the last mentioned varieties that if planted at the same time there will be a succession of flowering, thus securing more perfect pollination.

Among the questions for which answers have been sought are the following:

First—How does the number of staminate flowers compare with the number of pistillate flowers, or what is the proportion of pollen to ovules?

Second—What is the length of the period of blossoming of the staminate and pistillate flowers, respectively?

Third—What is the average or mean difference between the maturity of the stamens in the tassels and the maturity of the stigmas of the silk on the same stalk?

Fourth—What proportion of the pistillate flowers are usually fecundated?

Fifth—Are imperfect ears due to lack of pollination, impotent pollen, or to imperfectly ovuled pistillate flowers?

Incidentally to the above the rate of growth of different parts of the corn plant, the time between planting and blooming and between planting and maturity, were noted.

As might be supposed, the number of flowers upon a stalk of corn is quite variable in the same variety and likewise shows a marked difference in different varieties. For example, several large-eared dent varieties like Chester County Mammoth and Scott's Dent, each produced over 1500 pistillate flowers on a single stalk containing one ear. Two embryo ears on one stalk of the variety called Leaming produced 1875 flowers. Five embryo ears on a single stalk of Blount's Prolific averaged a little more than five hundred flowers on each ear, making 2500 pistillate flowers in all.

The above numbers were found by carefully removing the sheath from the undeveloped ear when the pistillate flowers are in full bloom and counting the number of styles or threads of silk.

When the varieties of corn in question ripened, a careful count of the number of kernels on ears of average size was made and the figures were as follows:

	No. of kernels on ear of Av. size.
Chester County Mammoth..	1010
Scott's Dent	990
Leaming	850
Blount's Prolific	420

This indicates that there is considerable variation between the number of pistillate flowers and the number of kernels on the ear.

It is not a difficult task to count the number of spikelets in a panicle and thus compute the number of stamens in the same.

Admitting that only one of the two florets in a spikelet has polleniferous stamens, we have but to multiply the number of spikelets by three and this gives us a fair approximation to the number of perfect anthers.

To correctly compute or estimate the number of cells of pollen in an anther is much more difficult and this task I did not attempt.

Harshberger places the number at 2500, and estimates that a single stalk of corn produces 18,000,000 pollen cells. A count of several average-sized panicles or tassels of dent corn gave a mean of 9300 pollen-bearing flowers. A similar count of the panicles of several flint varieties gave an average of 6500, while the same number of varieties of early sweet corn averaged only 1560 flowers with perfect anthers. That is, the following ratios between the pollen-bearing staminate flowers and the pistillate flowers of the same class of corn were observed.

	Pistillate flowers.	Pollen-bearing staminate flowers.	Ratio.
Dent corn ..	1520	9300	1: 6
Flint corn ...	940	6500	1: 7
Sweet corn....	545	7650	1:3.5

Using Harshberger's estimate of 2500 as the number of pollen cells in an anther, we have the following ratios between pollen and ovules for three different classes or races of corn:

Dent corn—No. of ovules, 1520; No. of pollen cells, 69,750,000; ratio in round numbers, 1:45,000.

Flint corn—No. of ovules, 940; No. of pollen cells, 48,750,000; ratio in round numbers, 1:52,000.

Sweet corn—No. of ovules, 445; No. of pollen cells, 11,700,000; ratio in round numbers 1:26,000.

The above figures indicate that there is a great excess of pollen produced, yet the fact remains that there are many imperfect ears of corn.

It is well known that among the various means by which cross-fertilization is insured and self-fertilization prevented, the difference in time of maturity of the pollen and stigmas in the same flower, or in different flowers on the same plant, plays a very important part. The following are the results of numerous observations on this point—observations which have extended over several years and which include fifteen or more distinct varieties of corn:

Dent corn (6 varieties)—Per cent. of stalks where pollen began to shed before the silk appeared, 96; per cent. of stalks where one-half of the pollen was shed before silk appeared, 76; per cent. of stalks where all pollen was shed before silk appeared, 32.

Flint corn (4 varieties)—Per cent. of stalks where pollen began to shed before the silk appeared, 89; per cent. of stalks where one-half of the pollen was shed before silk appeared, 60; per cent. of stalks where all pollen was shed before silk appeared, 38.

Sweet corn (8 varieties)—Per cent. of stalks where pollen began to shed before the silk appeared, 98; per cent. of stalks where one-half of the pollen was shed before silk appeared, 82; per cent. of stalks where all pollen was shed before silk appeared, 44.

If the above observations had been confined to stalks with a single ear, the results would have been somewhat different, for almost without exception the silk appears earlier in comparison with the maturity of the anthers, when there are more than one ear on a stalk. It must also be borne in mind that the first appearance of the silk in every case was counted, though only a few threads appeared. By waiting until one-half or more of the silk in each case was in a receptive condition, would have materially changed the percentage figures. Again, it was not easy to always tell just when the pollen is all discharged from a given panicle, and it is quite probable that too great a length of time was often allowed.

In several cases fully developed pistillate flowers instead of staminate, were found on the center spike of the panicle. In every case of this kind the pistillate flowers develop first. In fact, the ovules were all fecundated before any staminate flowers in the same panicle were in bloom.

From the results given above, there seems to be no question that Indian corn is cross-fertilized with almost as much certainty as our dioecious plants like the silver maple, willow, etc.

Dichogamy is so general a feature throughout the numerous well-marked varieties of corn, that it is scarcely possible to doubt that it has been inherited as an advantageous characteristic from the common ancestor of the different races of this plant.

As a rule, the discharge of pollen begins from two to four or five days before the silk appears. The staminate flowers first to mature are those situated on the upper part of the axis or center spike of the tassel. The flowering continues for the most part from above downward, those on the lower spikes ripening last, although the terminal flowers of the separate spikes are often later in opening than those lower down.

The pistillate flowers, in their order of development, are much the same as the staminate flowers on the main or central spike of the panicle. The flowers on the lower portion of the upper half of the coming ear appear first; next those of the lower half of the ear, and last, the flowers of the tip.

Depending upon the variety, temperature, sunshine and dryness of air, the length of time of the discharge of pollen from a given panicle varies from five to ten days. As a rule, it is discharged most abundantly during the forenoon from nine o'clock until eleven. The pistillate flowers are receptive or stigmatic as soon as the silk appears and continue in this condition for from four to six days, sometimes longer.

Coming ears that were covered were successfully pollinated by a single application of pollen the fifth day after the silk appeared. The varieties of corn that suffer the most from imperfect pollination in central Ohio are the early sweets. These are frequently planted in April, blossom early, and often seem to be unable to ear perfectly. Some horticulturists believe that a certain range of temperature, within variable limits, is necessary for the proper fecundation of each species of plant. The temperature at which corn will produce virile flowers has not been carefully studied. May it not be the fact that the failure to fecundate is the reason why corn cannot be more successfully grown in localities where the mean temperature of the summer months is lower than it is in the corn-producing sections of the United States.

A few years ago the writer saw some quite well-grown, vigorous-appearing corn in a garden in Yorkshire, England. The staminate flowers were fairly well developed, and a considerable percentage of the stalks showed silk. Yet I was informed that no ears would be produced on any of this corn. There seems to be no doubt that the warmest and sunniest weather is the best for the fecundation of this plant.

Failure of ears of corn to fill out at the tip has often been referred to lack of pollination. An examination of numerous prospective ears in full bloom shows that it is more often due to imperfect ovules. Each individual stalk of corn seems to have the energy or power to produce so many fully developed pistillate flowers. Taking the different varieties, this number is much more variable than the number of staminate flowers in the same variety. It is safe to say that where the ear is perfect below a certain point from the tip, that the defective end is due to the lack of perfectly formed ovules rather than lack of pollen, and no later planting or crossing of varieties will cure this defect.

The growth of the corn plant, under favorable circumstances, is extremely rapid. A plat of Livingston's dent, com-

prising about one-eighth of an acre, was planted the present season on June 11th. On August 9th, just sixty days from the date of planting, this corn was in full bloom and the stalks averaged something over eight feet in height. This was an average of something over one and one-half inches per day from the date of planting. Embryo ears on this corn grew at the rate of four inches in length per day, and several times a growth of six inches in length of silk during twenty-four hours was recorded. Some of the silks attained a total length of over eighteen inches.

Some Early Cleveland sweet corn, planted June 8th, was ready for market in fifty-five days from the date of planting, and not infrequently in our gardens sweet corn that is not planted earlier than June 1st is ready for use within two months from the time of planting.

GENERAL CONCLUSIONS.

(1) Many, if not most of the common varieties of Indian corn require cross-pollination, being partially or wholly incapable of producing a fruitful ear when limited to pollen of the same stalk. The principal reason for this being that the pollen matures before the stigmas are receptive.

(2) Under favorable circumstances there is a great excess of pollen and in plantations of any considerable size corn is usually well pollinated, owing to the duration of the period of flowering.

To secure perfect pollination of small areas, seed should be planted at different times or varieties that bloom in close succession should be selected.

(3) Imperfect ears of corn are due not alone to imperfect pollination, but to imperfect ovules as well. An ear that is not filled out at the tip is usually so because the pistillate flowers at this point were poorly developed. This may be corrected by a better selection of ears for seed or by better cultivation.

Light a Factor in Sugar Production.

(By H A. Weber.)

The fact that the United States is one of the greatest sugar consuming nations of the world and the fact that about nine-tenths of the sugar consumed is imported at an annual cost of about $100,000,000, have given rise, from time to time, to attempts in the direction of a greater home production of sugar than is possible from the long-established sugar cane industry of the Gulf States.

Owing to the geographical location of this country only such sugar producing plants could form the basis of these attempts as were adapted to cultivation in the temperate zone. Of these plants, only two need be mentioned here, namely, sorghum and the sugar beat.

As is well known, the early efforts at sugar production from beets in this country were absolute failures. Various causes contributed to this result, prominent among which was the antipathy of the American farmer to accommodate himself to the cultivation of beets, which is much more irksome than the cultivation of ordinary agricultural crops, to which he had been accustomed and which at that time brought him satisfactory returns for his labor. The country was not ripe for the establishment of the new industry.

In the late seventies and early eighties the experiments in making sugar from sorghum were at their height. This crop can be grown like corn, and its cultivation is much more in keeping with the tastes and practices of the American farmer than that of the sugar beet. Wherever sorghum sugar factories were established there was no difficulty whatever in securing an abundant supply of the cane delivered in proper shape at the mills. For a time the prospects of the sorghum sugar industry were bright. The sugar produced found a ready sale at remunerative prices, but unfortunately for those engaged in the new enterprise and fortunately for those who were about to invest on a larger scale, the sorg-

hum sugar industry, before it was fairly upon its feet, was confronted by a falling market, due to the over-production of sugar in Europe, and especially in Germany. This unexpected interference with the sugar market of the world gradually brought the price of sugar and molasses down to a point where the manufacture of sugar from sorghum was no longer profitable, and the new industry, which had excited general attention for three or four years, had to succumb, with all its investments a total loss. It may be said in passing that the sorghum sugar industry is dead for all times to come. The good old times for the manufacturer of sugar, when yellow C sugar sold for 8c per pound cash in car-load lots, are gone, never more to return.

These fruitless attempts at the establishment of a sugar industry in this country have been thus briefly referred to, for the reason that they are still of importance to us for the lessons which they have taught.

The Department of Agriculture at Washington, under the able direction of Dr. Wiley, has for many years made valuable investigation in connection with the sugar industry; but with the advent of the present Secretary of Agriculture a general interest in the subject of a home production of sugar has been renewed. The efforts of Secretary Wilson found the farmers throughout our country in a responsive mood, owing to the universal depression in agriculture for a number of years preceding his administration, and consequently in almost every county of many of the states in the past year experimental plots of sugar beets were grown.

Whether the establishment of this new agricultural industry in our country is advisable from an economic point of view or not, is a question foreign to this paper. This phase of the subject was ably discussed by Mr. Edwin F. Atkins in the Forum of November, 1897, in an article which deserves the earnest consideration of all who are interested in public welfare.

If, however, the efforts put forward should result in the establishment of a beet sugar industry in this country capable of producing our home demand for sugar, it should be borne in mind that this object must be accomplished in the face of an over-production of sugar in the world, a condition which, twenty years ago, would not have been considered possible. This over-production of sugar has come to stay. The margins of profit will necessarily be low. Of our vast domain the insignificant area of 2,000,000 acres of land subjected to beet culture will suffice for the production of our home demand for sugar. Taking all these facts into consideration, it is evident that the successful sugar factories will necessarily exist only in the most favorable localities, and in the course of a very short time factories blindly started in unfavorable localities will be crushed.

There are various conditions which must be supplied for the production of a sugar-producing plant rich enough in sugar to meet the competition at present existing in the manufacture of this article of food, as well as certain facilities for operating a factory after the plants are grown. Prominent among the former conditions is the matter of light.

The leaves are the laboratory in which the sugar is directly or indirectly synthesized and light is the agent.

All sugar-producing plants are equipped by nature with an abundant leaf surface, and when these plants are rescued from their unfavorable surroundings in wild vegetation and subjected to cultivation, their leafy organs are capable of elaborating and storing much more sugar than is necessary for the perpetuation of the species. This excess of production is utilized by man for the manufacture of sugar.

It would seem evident, therefore, that other things being equal, the more light one of these plants could get during its period of vegetation the higher its content of sugar would be. The truth of this proposition has been confirmed by nu-

merous observations made upon sugar-producing plants.

Sugar-producing plants may be divided into two categories, namely:

1. Those having a long period of vegetation, as the different varieties of southern cane, and

2. Those having a short period of vegetation, as sorghum and the sugar beet.

The former group of plants, when cultivated in tropical regions, grow luxuriantly for a period of eighteen months, and at the end of this time the content of sugar in the juice reaches 18 to 20 per cent. The crop of sugar cane is, however, usually taken off after a period of twelve months, when the content of sugar in the juice is only 14 to 15 per cent.

The increase in amount of sugar in the longer period of vegetation is due to the greater amount of sunlight to which the growing plants have been exposed. Owing to this long period of vegetation, southern cane is not so much affected by climatic conditions and suitable locations as is the case with plants of a short period of vegetation.

The latter group of sugar producing plants, in which the present territory of this country is directly interested, are affected in many ways by the amount of light available during the period of vegetation, which on account of the present competition in the manufacture of sugar, may mark prospective enterprises with success or failure, as the case may be.

1. Climatic conditions must be taken into consideration in the location of sugar factories.

Localities in which the seasons vary greatly in the amount of clear weather are not so well adapted to the growing of rich sugar plants, as those in which clear weather during the growing season predominates every year. As an example illustrating this fact may be mentioned the experience of the writer in the investigation of sorghum as a sugar- producing plant.

The years of 1880, '81 and '82 in the locality of Champaign, Ill., were typical sugar seasons. During the summer months clear weather prevailed. The cane sugar in the juice of the best varieties of sorghum reached 13 to 14 per cent. The co-efficient of purity of the juice was high and with proper precautions in treating the juice, sugar could readily be made, even with crude apparatus. The years following were less favorable in this respect. In 1883, for example, cloudy weather with rain prevailed almost daily during the summer months. As a consequence the content of cane sugar in the juice of the better varieties of sorghum reached 8 to 10 per cent. The purity of the juice was correspondingly low, and the manufacture of sugar extremely difficult.

Four sorghum sugar factories were erected in consequence of the favorable results obtained in the preliminary experiments of '80 and '81 at Champaign, Ills., conducted by Prof. M. A. Scovell and the writer. It is safe to say that if the weather of these two seasons had been similar to that of '83, the factories would not have been started and the capital and labor invested in them lost.

The ideal localities in this respect are the arid plains of the western states, where the necessary soil moisture can be supplied by irrigation. Here for a given degree of latitude the maximum amount of light is available for the growing crop, and poor sugar seasons can not occur.

2. The higher latitudes are more favorable, other things being equal, than the lower ones, owing to the greater length of the days and the longer duration of twilight.

The sorghum sugar industry again can furnish data illustrating this point.

Among the numerous visitors from all points of this country and from many foreign countries to the factory at Champaign, Ill, was a party from Tennessee, who claimed that the "Sunny South" was the place for raising sorghum. Capital was raised, a factory erected at Franklin, Tenn., and about 700 acres of sorghum was grown. The yield of the crop was heavy. But the sugar content of the juice was very disappointing, it

being about 4 per cent. lower than that of sorghum grown in central Illinois, although the season was an ordinary one for that section of the country.

The plant from which the sugar beet has been derived is indigenous along the shores of the Mediterranean sea, but it has been developed into one of the most important sugar-producing plants in the latitudes of northern Germany and France.

The writer does not wish to be understood as claiming that a higher latitude is under all circumstances better than a lower latitude. The climatic conditions already mentioned, and other conditions to be considered further on, may more than compensate for the increase of light obtainable through a more northerly location.

3. Proximity to large bodies of water is favorable to sugar production. This is due to the fact that near the shore of such bodies of water and extending for a considerable distance inland, the location has the advantage of a more intense light, caused by the direct rays of the sun, in addition to the light reflected from the surface of the water. The writer had an opportunity of investigating this point during the past season.

Sugar beet seed of the Klein-Wanzleben variety was universally distributed over the state of Ohio by the Department of Agriculture at Washington, and also very generally planted for experimental purposes. Samples of beets were obtained representing a section of the state from Lake Erie to the Ohio river. A sample consisted of four average beets of each field or plot from the largest size down to about one-half pound in weight. Each beet was wrapped in paper and the sample sent by express to our laboratory to insure as slight a change as possible in the sample, and immediately analyzed. In addition, and in order that the results obtained might be strictly comparable, the percentage of juice was determined in each case.

Without going into details, the results of the investigation clearly indicate that the region of the state of Ohio bordering upon the lake has advantages in the raising of sugar beets of high grade which are not possessed by other portions of the state. The best sample of beets in the whole list was grown at Oak Harbor, near Lake Erie. The smallest beet weighed 20 ounces and the largest 29 ounces. The percentage of sugar in the juice was 16.3 and in the beets 15.68. The coefficient of purity was 81.71.

A sample grown at Locust Point, on the lake, exemplified in a high degree the possibilities of the lake region in producing beets with a high content of sugar. The smallest beet of the sample weighed 28 ounces and the largest 71 1-4 ounces, or nearly 4 1-2 pounds. The percentage of sugar in the juice was 14.2 and in the beets 13.8, with a coefficient of purity of 81.42.

The same may be said of another sample grown at Locust Point. The smallest beet of this sample weighed 60 1-4 ounces and the largest 70 1-4 ounces. Even these enormous beets, with an average weight of four pounds, were found to be above the standard for content of sugar and purity of the juice, as generally accepted for the manufacture of sugar.

The remarkable richness of these overgrown beets becomes more apparent when contrasted with a sample grown in Licking county in the central portion of the state. This beet weighed 40 3-4 ounces, the content of sugar was 8.47, and the purity 64.68.

Although some samples were obtained from other sections of the state which were of good quality for the manufacture of sugar, yet other samples of the same sections fell below the standard. The lake region alone produced beets which were uniformly of a high grade, when all the requirements of a good beet were taken into account.

4. Topographical features of land are of importance in determining a suitable location for a sugar factory.

It is well known that beets grown in the shade are worthless for the manufacture of sugar. In view of this fact it would seem almost superfluous to say that a partial obstruction of the direct rays of the sun daily would cause the production of an inferior crop of beets than would be the case if such obstruction did not occur. Consequently, level tracts of land, where, on clear days, the plants are exposed to the direct rays of the sun from morning to night, must be better adapted to beet culture than deep valleys, especially if they are narrow and skirted by hills or mountains, and if, in addition, their general course is from north to south.

The writer is convinced that the variation in the composition of beets grown in the same section of the country, having a diversified topography, is due in a great measure to the injurious selection of the fields in this respect.

There are other factors which enter into the successful inauguration of the proposed new beet sugar industry in this country, but as a guide to the selection of the most favorable localities for its permanent establishment, the matter of light should receive due consideration.

BOOK REVIEW.

AN ILLUSTRATED FLORA of the Northern United States and Canada, westward to the 102d Meridian, including Kansas and Nebraska, by Prof. N. L. Britton and Hon. Addison Brown; 3 volumes; Royal 8vo.; 1875 pages in all; illustrated; cloth; Charles Scribner's Sons, New York; $3.00 per volume.

To our knowledge this is the first attempt that has been made in this country at a complete illustrated flora, and the favorable comment of scientists thus far testifies to the success with which this attempt has been pursued. After years of toil the authors have succeeded in putting forth this colossal work, which, for detail of description, clearness of statement and simplicity of expression is unsurpassed.

The work consists of three volumes, and for those who may wish to know the range of the different parts, we will give the limits of the orders included in each:

Vol. I. pp. XII+612; figured species 1425. FERNS to CARPETWEED.

Vol. II. pp. IV+643; figures 1426 to 2892. PORTULACA to GENTIAN.

Vol. III. pp. XVI+588; figures 2893 to 4081. Appendix 81 figures. DOGBANE to THISTLE.

This work has a great advantage over all other works on the botany of the United States, in that each species described is accurately and clearly illustrated. This feature makes it an invaluable help not only to the specialist but to the beginner in the study of plants.

Persons wishing to procure copies of this work may do so by sending subscriptions to Charles Scribner's Sons, New York, or to Prof. N. L. Britton, 63 E. 49th street, New York. To clubs or schools ordering 10 copies or more, 15 per cent. discount will be given.

Be absolutely impartial in all statements. State clearly all the important facts that bear upon the subject; it makes no difference whether they bear out your opinion or not; leave the reader to judge for himself. Remember that things hit better when they are in small compass. Not only are the results better, but space in any decent agricultural paper is scarce. The agricultural papers in the future must look to the graduate in agriculture for the best, clearest, and most logical of their materials. This material must be gotten up in a clear, strong way and be related to experience and based upon facts. In these ways you can help to pay the state for the large sum of money which it has spent upon you. W. I. CHAMBERLAIN.

BIOLOGICAL HALL.